A new hawk-owl from the Togian Islands, Gulf of Tomini, central Sulawesi, Indonesia

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The Togian Islands in the Gulf of Tomini, central Sulawesi, Indonesia (Fig. 1) are small islands, of which *c.*25% is covered by lowland forest. The archipelago is separated from central Sulawesi by largely shallow water, in places less than 200 m deep. Ornithological explorations have recently been mounted to the group (Indrawan *et al.* unpubl.), but no endemic bird species were previously known. The avifauna of Sulawesi includes two species of barn owls (Tytonidae) and four typical owls (Strigidae). The former family is represented in Sulawesi by the endemic Minahassa Masked-owl *Tyto inexspectata* and Sulawesi Owl *T. rosenbergii*, which is endemic to Wallacea. The four other owls of mainland Sulawesi are: the northern winter visitor, Brown Hawk-owl *Ninox scutulata*, and three Sulawesi endemics, Sulawesi Scops-owl *Otus manadensis*, Ochre-bellied Hawk-owl *Ninox ochracea* and the recently discovered Cinnabar Hawk-owl *N. ios* (Rasmussen 1999, Lee & Riley 2001).

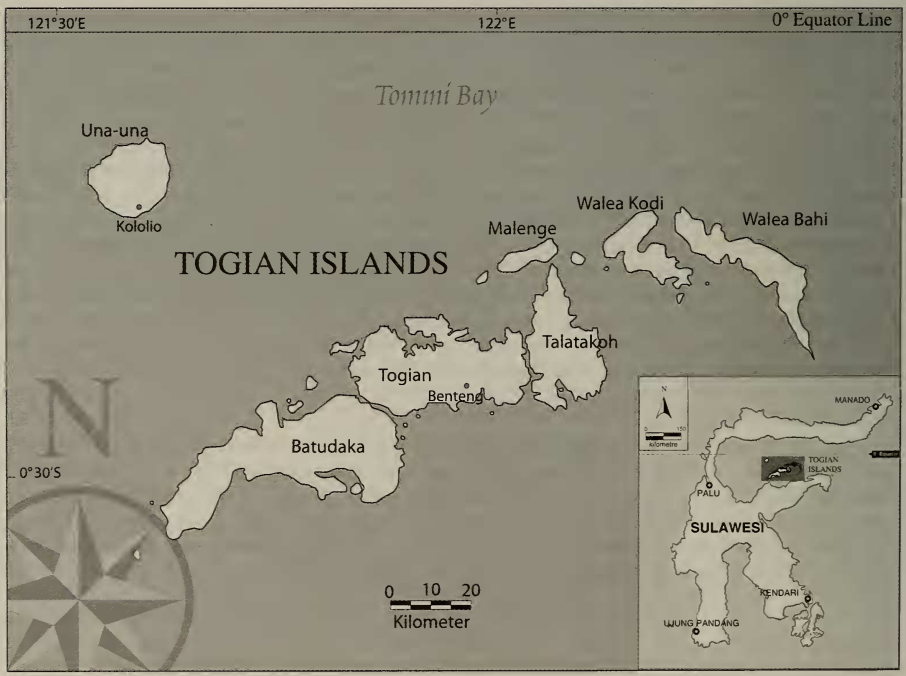

Figure 1. Map of the Togian Islands.

Figures 2–3 (above and top right). Live Togian Hawk-owl *Ninox burhani*, Togian Islands, 13 April 2001 (M. Indrawan)

Figure 4 (bottom left). Dorsal and ventral views of the holotype and paratype of Togian Hawk-owl *Ninox burhani* (Mr Arief)

Figure 5 (bottom right). Dorsal and ventral views of, from left to right, Togian Hawk-owl *Ninox burhani* (holotype), Ochre-bellied Hawk-owl *N. ochracea,* Speckled Hawk-owl *N. punctulata* and Brown Hawk-owl *N. scutulata*. Note that Barking Owl *N. connivens* was not included because of its disproportionately large size (Mr Arief)

Prior to the present study, no owls were listed for the archipelago, despite its relative proximity to the mainland (Meyer 1879, Meyer & Wiglesworth 1898, Peters 1940, Stresemann 1940, Ripley 1941, White & Bruce 1986, Owen *et al.* 1987, Sibley & Monroe 1990, Coates & Bishop 1997, Holt *et al.* 1999, König *et al.* 1999). Although the Togian Islands had previously been explored by our research group (Indrawan *et al.* unpubl.), no sightings or aural records had been made of any owl, and thus we did not expect to find any owls in the islands. However, unidentified owl vocalisations were heard on the night of 25 December 1999, whose source was searched for, resulting in the observation of three birds (see Observations), which we now know to belong to an undescribed species. The new species was discovered during the first visit to Benteng, a village with gardens and surrounded by lowland forest.

Here we describe a new species of hawk-owl and provide new records of typical owls for the Togian archipelago, based initially on field observations and, thereafter, two specimens collected for and housed at the Museum Zoologicum Bogoriense (MZB), Cibinong, near Bogor, Indonesia. Colour matching was performed under natural light using Smithe (1975) colour swatches.

Ninox burhani sp. nov. Togian Hawk-Owl

Holotype. MZB 30.365, adult male, collected in scrubby forest below 100 m a.s.l., at Benteng village, Togian Island, Togian archipelago, Gulf of Tomini, central Sulawesi, Indonesia, by R. M. Hidayat with the assistance of Burhan and Iling Taskir, on 8 April 2001 (Fig. 4.).

Paratype. MZB 30.366, adult male, collected in sago swamp at Baulu village, Togian Island, Togian archipelago, at sea level, by M. Indrawan with the assistance of Nasution and Akim, on 26 March 2002 (see Fig. 4).

Measurements and weight of the holotype (in mm; weight in g). Wing (chord) 183.5, tail 98.0, culmen 22.5, tarsus 29.0, weight (post mortem) 100 g (Table 1).

Specimens examined (including the holotype). Two males collected from Benteng and Baulu villages, Togian Island, Togian archipelago, Gulf of Tomini, central Sulawesi, Indonesia.

Description of the holotype. Plumage fresh (Fig. 4), the front of the head, crown, back and streaks on the breast approach Mars Brown (223A) and Verona Brown (223B). The face has a prominent pattern, with pale or Tawny Olive (223D) supercilia, pronounced fine barring on the crown and nape to upper mantle, coloured Sayal Brown (223C). Abdomen white with Raw Umber (223) shafts. Flight feathers spotted, alternating between white and pale Tawny Olive (223D). Wings have triangular white spots on the primaries. The relatively long tail is between Dark Greyish Brown (20) and Fuscous (21), and prominently banded with paler narrow bars of Tawny Olive (223D). Irides, based on photographic compari-

TABLE 1

Measurements (in mm) of wing, shortfalls (distance of tip of each primary from the longest primary), tail, pale and dark tail bars (width), culmen and tarsus, and weight (g) of *Ninox burhani* sp. nov., *N. ios* and *N. ochracea*.

	Ninox burhani MZB 30365	*Ninox burhani* MZB 30366	*Ninox ios** RMNH 84701	*Ninox ochracea* MZB 5422	*Ninox ochracea* MZB 17713	*Ninox ochracea* MZB 17714
	♀ ♂	♀	♀	♀	♂	♀
Characters						
Wing	183.5	183.0	172.0	183.5	183.5	179.0 m
Shortfalls:						
P1	52.0	nm	53.0	49.0	55.0	m
P2	22.0	nm	16.0	17.0	19.0	m
P3	6.0	nm	2.0	2.0	5.0	5.0
P4	0	nm	0	0	0	0
P5	2.0	nm	2.0	0	0	4 m
P6	8.0	nm	11.0	10.0	7.0	9.0
P7	21.0	nm	21.0	22.0	20.0	21.0
P8	35.0	nm	33.0	31.0	31,5	34.0
P9	43.0	nm	39.0	46.0	44.0	45.0
P10	51.0	nm	47.0	51.0	49.0	51.0
Tail	98.0	98.0	97.0	103.0	109.0	101.0
Tail bars:						
Pale	2.0	3.0	4.0**	2.0	2.0	2.0
Dark	9.5	7.5	3.0**	9.0	8.0	7.0
Culmen	22.5	23.0	17.9	24.0	23.0	23.0
Tarsus	29.0	29.0	22.6	30.0	28.0	–
Weight (g)	100†	98†	78	–	–	–

Notes: * = data from Rasmussen (1999); ** = measured by R. W. R. J. Dekker (Nationaal Natuurhistorisch Museum, Leiden [RMNH]) of bars approximately in the middle of the tail; m = moult; † = post-mortem weight; nm = not measured (primaries worn, the first and second primaries missing through moult). MZB 5422: male, collected on Buton Island, by Mohari, in 1910; MZB 17713: female, collected at Tonsea-lama, Tondano, Manado, by J. A. v. Braekel, no date; MZB 17714: male, collected from Bumbulan, Celebes, by J. J. Menden, on 30 October 1939.

son, Orange Yellow (18), and bill paler than Cream (54) with a darker greyish base. Rictal bristles blackish, but the basal half is Mars Brown (223A). Tarsi relatively slender and, like the toes, unfeathered but bristled. Summary information on plumage coloration is presented in Table 2, and the range of variation observed in the field provided in the Observations section.

Diagnosis. Differences between *Ninox burhani* and its three congeners (Ochre-bellied Hawk-owl *N. ochracea*, Speckled Hawk-owl *N. punctulata* and Brown Hawk-owl *N. scutulata*) are readily observed (Fig. 5, which does not include *N. ios*, as MZB lacks specimens of this species, or Barking Owl *N. connivens*, which is much larger than the other four).

The new species is medium-sized, brown hawk-owl, with white lower underparts, from the lower breast to the vent, streaked with brown. Like most typical owls, but unlike Cinnabar Hawk-owl (Rasmussen 1999), the face has prominent supercilia, which may meet above the nasal area. In the hand, the crown and nape are heavily barred. Flight feathers marked with white and pale spots. Cinnabar Hawk-owl (specimens from Gunung Ambang, northern Sulawesi) is bright rufous and lacks supercilia or spotted flight feathers (Rasmussen 1999), both of which are present in Togian Hawk-owl.

The spotted flight feathers are shared with Ochre-bellied Hawk-owl (one specimen, from Buton Island, south-east Sulawesi), although the spots are perhaps slightly larger in Togian Hawk-owl. The upperparts of Ochre-bellied Hawk-owl are similar to those of Togian Hawk-owl, between Mars Brown (223A) and Verona Brown (223B), although the latter species is perhaps marginally darker brown, with distinct fine pale barring on the nape to upper mantle. The barred tail is more pronouncedly so in Togian Hawk-owl, but the most distinctive character separating it from Ochre-bellied Hawk-owl is the white lower underparts streaked with brown.

Togian Hawk-owl has similar upperparts coloration to those of two MZB specimens of Speckled Hawk-owl from Lindu (central Sulawesi) and Rurukan (northern Sulawesi). Any difference would be difficult to discern in the field, for instance Mars Brown or Verona Brown versus Raw Umber, respectively. However, Togian Hawk-owl's underparts differ from those of Speckled Hawk-Owl (white with streaks of Mars Brown and Verona Brown versus Prout's Brown [121A] with dense and uniform short bars of Buff [124]). The tail feathers are, unlike Togian Hawk-owl, relatively short. The tarsus of Speckled Hawk-owl is heavily and densely feathered, unlike Togian Hawk-owl. Like Togian Hawk-owl, however, the toes are bristled.

The migratory Brown Hawk-owl *N. scutulata japonica* is larger (but much smaller than Barking Owl). Two MZB specimens, from Amurang (northern Sulawesi) and Buru (in the Moluccas), were examined. Upperparts between Warm Sepia (221A) and darker than Ground Cinnamon (239), for the Buru and Amurang specimens, respectively, and unlike Togian Hawk-Owl. Underparts (from breast to vent) uniformly and heavily streaked, unlike Togian Hawk-Owl. These streaks varied between Warm Sepia (Buru) and Ground Cinnamon (Amurang), and white washed Buff (124). Unlike Togian Hawk-owl, tail bars pale and relatively broad, with the pale bands slightly wider than the darker bands. Unlike Togian Hawk-owl, tarsus feathered, albeit less densely than Barking Owl. Like Togian Hawk owl, toes bristled.

Barking Owl is markedly larger (e.g. wing of three MZB specimens from Obi, in the central Moluccas, averaged 260 mm) and the upperparts markedly paler, almost Verona Brown (223B). Underparts pale with elongated streaks, alternating between Sayal Brown (223C) and Yellow Ochre (123C), from the upper breast, not restricted to the lower breast as in Togian Hawk-owl. Tail bars less pronounced and

TABLE 2
Comparisons of colour (Smithe 1975) of *Ninox burhani*, *N. ochracea*, *N. punctulata*, *N. scutulata* and *N. connivens*.

Plumage	*Ninox burhani*	*Ninox ochracea*	*Ninox punctulata*	*Ninox scutulata*	*Ninox connivens*
Front of head, crown and mantle feathers	Between Mars Brown (223A) and Verona Brown (223B), crown feathers with fine bars of Sayal Brown (223C)	Between Mars Brown (223A) and Verona Brown (223B)	Raw Umber (223)	Between Warm Sepia (221A) and darker than Ground Cinnamon (239), on Buru and Amurang specimens respectively	Approaching Verona Brown (223B)
Supercilium	Present	Present	Present	Present	Present
Upperparts	Between Mars Brown (223A) and Verona Brown (223B)	Between Mars Brown (223A) and Verona Brown (223B)	Raw Umber (223)	Between Warm Sepia (221A) and darker than Ground Cinnamon (239), Buru and Amurang specimens respectively	Verona Brown (223B)
Scapulars and primaries	Between Raw Umber (223) and Mars Brown (223A), with patches of whitish and Tawny Olive (223D)	Mars Brown (223A) with patches of white and Tawny Olive (223D)	Raw Umber (223)	As above	Verona Brown (223B)
Flight feathers	Patterned, mostly with triangular spots	Patterned, mostly with triangular spots	Patterned with spots, but much smaller than those in other species	Patterned with bars and a few white spots on the inner webs of the primaries	Patterned with bars and a few white spots on the inner webs of the primaries
Breast feathers	Between Mars Brown (223A) and Verona Brown (223B)	Clay (123B) with dark Brussel's Brown (121B)	Raw Umber (223). Upper breast has a broad dark band (Raw Umber, 223) between chin and lower breast, which are white or Buff (124)	Uniformly and heavily (boldly) streaked. These streaks vary between Warm Sepia (221A, Buru) and Ground Cinnamon (239, Amurang)	Buff (124) with elongated streaks of Sayal Brown (223C) to Yellow Ochre (123C)

Plumage	*Ninox burhani*	*Ninox ochracea*	*Ninox punctulata*	*Ninox scutulata*	*Ninox connivens*
Abdomen	White with streaks of Mars Brown (223A) and Verona Brown (223B), and Raw Umber (223) shafts	Between Clay (123B) and Yellow Ochre (123C)	Prout's Brown (121A) with dense and uniform small bars of Buff (124)	As above	As above
Tail bands and coloration	Tail bands very pronounced, and dark bands much broader than pale bands. Dorsal: the dark bands approach between Dark Greyish Brown (20) and Fuscous (21), with paler bands of Tawny Olive (223D)	Tail bands less pronounced, and dark bands broader than pale bands. Dorsal: dark bands of Prout's Brown (121A) and paler bands between Sayal Brown (223C) and Tawny Olive (223D). Bands on outer part of the inner webs had a Chamois half-band (123D)	Tail bands highly pronounced, with very narrow pale bars. Dorsal: the dark bands approach Raw Umber (223) and pale bands approach Buff (124)	Tail bands very pronounced, with broader pale bands. Dorsal: pale bands are the same or paler than the upperparts (Amurang and Buru specimens, respectively), whereas the dark bands are Vandyke Brown (121)	Tail bands less pronounced, with indistinctly contrasting pale bands. Dorsal: darker bands of Mars Brown (223A), and paler bands of Verona Brown
Tarsus	Unfeathered, but bristled	Unfeathered, but bristled	Heavily and densely feathered	Feathered	Heavily and densely feathered
Toes	Bristled	Bristled	Bristled	Bristled	Bristled

relatively broad. Unlike Togian Hawk-owl, tarsus feathered, but like Togian Hawk-owl, its toes are bristled.

Habitat. The new species has been observed in disturbed lowland and hill forest, mixed gardens and sago swamp, at elevations from sea level to 400 m. Although it is found regularly in scrubby forests, such locations are within a mosaic of evergreen rainforest remnants in various states of disturbance. The owl appears rare within garden and settlements, for instance at the villages of Wakai and Malenge, and thus is generally a forest species. Roosts in disturbed lowland forest are usually heavily shaded and at the mid-canopy level, being further characterised by dense stands of narrow-girthed trees entangled with vines, and frequently heavy bamboo cover, a microhabitat also used by other typical owls in the islands (see below).

Etymology. The species is named for Burhan of Benteng village, in recognition of his knowledge of the birdlife of Togian. Burhan, Iling Taskir, Nasution and other

members of the local community are capable students of, and interested to conserve, the islands' birds and their habitats.

Notes. The type specimen was caught alive in scrubby forest on 8 April 2001 (*c.*13.00 h), by R. M. Hidayat. Initially, blowpipes with paper-wrapped sticks were employed, but these failed even to stun the bird. The specimen was eventually caught alive using a catapult and small stone. On 14 April 2001, it was taken to Ragunan Zoo, Jakarta, for veterinary care but died 48 hours later. The holotype was prepared as a study skin by Anandang on 16 April 2001, and subsequently reshaped with the assistance of Mohammad Toha, one of the best taxidermists at MZB, one week before his untimely death on 10 July 2002.

The paratype was taken once field observations had proved that the species was sufficiently common to warrant further specimen collection, and that the available habitat sufficiently extensive to suggest that the taxon is present throughout much of the archipelago (cf. Collar 2000). To minimise impact to the local population, the second specimen was taken at a different locality almost one year later. It was collected at a sago swamp near Baulu village, Togian Island, at sea level, on 26 March 2002 (*c.*09.00 h). Prior to its capture, the bird was roosting on a branch 2.5 m above ground, near its presumed mate. It was collected using an air rifle, as current local transportation logistics now prohibit the live transport of birds to MZB.

Observations

25 December 1999, c.20.15–20.30 h, Benteng village

Three unidentified hawk-owls, hunting from perches in a garden, were observed at night using torches. They were medium-sized true owls, lacking ear-tufts, with a dark mantle scalloped paler, darkish facial disk, grey bill, white underwings and undertail patterned with fine black spots, pale underparts broadly streaked pale brown on the upper breast, becoming less dense on the abdomen. Due to the poor light it was unclear whether the mantle was dark brown, as in Brown Hawk-owl, which is known from the Sulawesi subregion. Indeed, the first individual was initially identified as a Brown Hawk-owl, but this species was eliminated at the time of observation, and subsequently, because of the patterned upperparts and paler-streaked underparts.

27 December 1999, c.09.00–09.10 h, Benteng

A single unidentified hawk-owl was flushed from a roost in bamboo. It was medium-sized and brownish, with yellow irides, pale supercilia, a uniformly deep chestnut-brown head, greyish-brown mantle with bold pale spots, boldly streaked greyish-brown, pale underparts and brownish feet. This individual apparently differed from those observed two nights previously in having a paler mantle and less white on the breast.

24 February 2001, c.08.30–08.45 h, Benteng
Three unidentified hawk-owls roosting in the mid-canopy on a forested hillside were flushed and good views obtained of two. Upperparts, head, chin, throat and upper breast (to approximately the wing bend) brown. Supercilia whitish. Lower breast and abdomen white, with long brown shaft-streaks that decreased on the belly, and vent entirely white. Wings patterned with rounded spots, becoming denser near the trailing edge. Irides yellow and bill grey to black.

14 May 2001, c.15.00 h, Benteng
The fourth observation was at 400 m on the slopes above Benteng, where a pair of unidentified hawk-owls was flushed. Their plumage did not appear to differ from that of the type specimen collected the previous month.

27 July 2001, c.1315–13.20 h, Belas (Benteng)
Two unidentified hawk-owls were flushed from their roost, in vine-entangled 5-m tall hillside scrubby forest. After ten minutes they were relocated and good views obtained for *c.*5 minutes, whereupon they disappeared again. They were similar in appearance, but differed in size. Head and face uniform dark brown, with an indistinct facial disk and obvious whitish supercilium. Irides yellow, mantle brown, spotted ochraceous-buff on the wing-coverts and scapulars. Underparts, from breast to vent, uniform ochre with traces of a few weak, irregular streaks on the upper breast. Their ochre bellies clearly identified them as Ochre-bellied Hawk-owls, although the white chin was not seen (cf. Coates & Bishop 1997). Bill blackish with a paler greenish culmen. Tail relatively short, but tail bars (if any) not seen. Feet yellowish green. They appeared to differ in size by *c.*20–30%. Based on this and their behaviour (i.e. two birds roosting and remaining together), it is probable that they were a pair.

28 July 2001, c.13.00–13.10 h, Benteng
The next observation was at the edge of primary forest, on a slope at *c.*100 m. Initially a guttural call was heard (at 13.00 h.), *KO-KORO-OK*, preceded by a single-note croak, which is the most frequently heard call (see below). After five minutes two hawk-owls were found roosting together 10 m above ground. They flew but one was briefly relocated. It appeared similar to the type specimen, with dark brown mantle and wings, scapular spots, a brown head with an indistinct facial disk, whitish supercilia and yellow irides. Breast whitish, boldly streaked darkish chestnut-brown and vent uniformly pale (the diagnostic characters that identify the type specimen). Bill dark grey with a greenish culmen. Tail relatively short, i.e. little longer than the wing.

1 August 2001, c.11.25–11.30 h, Belas (Benteng)
The final observation was made at Belas (where *N. ochracea* was also found). Two flushed from a roost departed in different directions. After searching for 30 minutes,

only one could be relocated and was observed for seven minutes, before it disappeared into denser vegetation. It was a dark brown hawk-owl with a brown head and mantle, an indistinct dark brown facial disk, spotted scapulars and wing-coverts, yellow irides, whitish supercilia, a dark greenish bill and relatively short tail. The underparts pattern, however, differed from the type specimen, in being pale ochraceous, but somewhat paler than in *N. ochracea*. Like the type specimen, the breast and abdomen were streaked brownish and the vent unmarked. Thus, this individual appeared intermediate in plumage, but closer to *N. burhani*. The tail was not seen well, but its underside was barred relatively densely with ochre and brown.

Vocalisations

No direct observation was made of birds vocalising. However, one call, which was heard extensively on Togian and Batudaka islands, was presumed to belong to this form for two reasons. Firstly, both the call and the owl are relatively common. Secondly, on 28 July 2001, the characteristic call was heard immediately prior to a sighting of two *N. burhani*.

This call is a gruff, low-pitched, two- to four-syllable croak, *KOK-KO-RO-OK*! The sequence is occasionally repeated and sometimes preceded by an introductory croaking note. It differs from that of the migratory form of Brown Hawk-owl *N. scutulata japonica*, which utters a mellow whistle, sometimes in couplets (Coates & Bishop 1997, King 2002). Birds possibly singing in territorial defence were noted frequently. Calling was noted at 20.00–04.00 h (December 1999 and February 2001).

Distribution and status

Observations and vocalisations indicate that the new owl is resident and probably breeds locally in Malenge, Togian and Batudaka islands (based on interviews with Amir Dodoa, Alan and Salim). That the owl is resident during the northern winter is confirmed by observations in July–August 2001. Croaking notes that we believe pertain to the new species were detected further east, on Waleabahi Island (in March 2002), implying that it is widespread in moderate numbers through the archipelago.

Surprisingly, during the most recent visit to the islands (18–31 July 2003), a six-day search of the species' day-roosting locations (on 19–24 July) failed to produce any sightings, although vocalisations were heard on several nights. The period in which this visit occurred coincided with the end of the rainy season. The difficulty in finding the species during daytime might have been due to increased concealment and it is postulated that at this season most birds are perhaps moulting and thus more secretive.

Discussion

The discovery of a new endemic bird in the Togian Islands is unexpected, given that the group is scarcely isolated from the eastern peninsula of Sulawesi. Although the water separating the islands from the mainland reaches *c.*1,440 m in places, a bathymetric map suggests that a long narrow bridge in shallow water, less than 150 m deep, appears to connect the shelves of the eastern peninsula to the Togian Islands. Between them are numerous stepping-stone islands. This potential land bridge is broken only by a narrow fault, less than 3 km wide and 500 m deep (BAKOSURTANAL 1993).

The co-occurrence of two species of Ninox (*N. burhani* and *N. ochracea*) merits interpretation. It is probable that the insular processes within the Togian Islands provides for the formation of neo-endemics, of which *Ninox burhani* is part. It is therefore postulated that birds of this group are subject to inter-archipelago speciation, leading to these owls occurring in sympatry (as opposed to closely related allospecies), therefore indicating complete speciation (cf. Diamond 1977).

Conclusion

The discovery of a new species of owl offers hope that the Togian group might produce further endemic vertebrates. Furthermore, Togian Hawk-owl, although persisting in dense scrub, is principally a forest-dependent species. The discovery provides additional justification to halt forest clearance, which is increasing in the Togian Islands (e.g. Indrawan 2000).

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Nomenclatural solution for a polyphyletic *Agelaius*

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One function of taxonomy is to reflect phylogeny and evolutionary relatedness. Indeed, for many researchers, taxonomy represents a simple tool for introducing assumptions of phylogenetic relationships into comparative studies of extant taxa. The difficulty is that our understanding of avian phylogeny is improving very rapidly and taxonomy, which changes very slowly, is increasingly in conflict with this new information. If taxonomy is to be a useful tool for biologists, we must balance our desire for stability in nomenclature with the need for taxonomy to reflect accurately our knowledge of evolutionary relationships. Consequently,